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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/751,000	12/29/2000	Sadao Hirae	P/1596-51	9450

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EXAMINER

WINTER, GENTLE E

ART UNIT	PAPER NUMBER
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1746

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DATE MAILED: 09/16/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/751,000

Applicant(s)

HIRAE ET AL.

Examiner

Gentle E. Winter

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 December 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) _____ is/are rejected.
- 7) ☒ Claim(s) 11,12,15,16,27,28,30 and 31 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 December 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. It is noted for the record that no information disclosure statement has been received.

Claim Objections

2. Claims 10-12, 14-16, 26-28, 30-32 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim.

Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. In the above claims the additional limitation is drawn to a future intended use and as such fails to substantively narrow the independent claim from which it depends. Specifically, the recitation of a adding a base to the apparatus is drawn to a future intended use. The above-indicated claims are rejected/allowed, according to their independent base claims and any intervening dependent claims.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 9-12, 25-28, and 29-32 are rejected because each of claims 9, 25, and 29 is drawn to an apparatus but has process limitation which is improper. Such claim format confuses the metes and bounds of the claimed invention.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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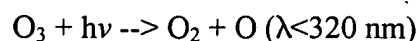
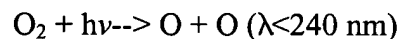
A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-8, 9, 11, 13, 15, 17-25, 27, 29 and 31 are rejected under 35 U.S.C. 102(b) as being anticipated by United States Patent No. 5,464,480 to Matthews Regarding claim 1, the instant application claims a method for substrate cleaning, including the steps of supplying an ozone containing cleaning solution to the substrate and irradiating the cleaning solution with ultraviolet light. It is noted that the sequence of the steps is not specified. Thus, no limitation regarding a step sequence will be assumed.

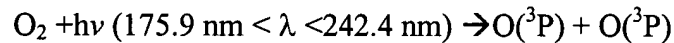
5. Matthews discloses a substrate treating method that utilizes a tank, fitted with ultraviolet light source, for subjecting a cleaning solution to UV radiation (column 10, line 3 *et seq.*). Further, the UV source is disclosed as being mountable on the outside of the tank or, preferably, is submerged into the tank and placed over diffuser, as shown at 3 in FIG. 1 and FIG. 2. The UV light is disclosed to have utility as a means for generating oxygen free radicals and oxygen molecules from ozone bubbled directly into the treatment tank for removal of organic materials on wafer during operation of the disclosed ozonated water process.

6. With specific respect to claims 3-4 and 7-8, Matthews fails to disclose the specific wavelength of the UV light source. However the chemistry described appears to mirror that which would occur according to the Chapman cycles (Chapman, 1930), namely:



uv ($\lambda < 240$ nm) higher energy than $h\nu$ ($\lambda < 320$ nm)

7. Of note, is the disclosure of Brasseur and Solomon [1985] disclosing:



8. In either case the formation of the oxygen radical, which is described in Matthews would have required the instantly claimed wavelength. (See also claims i.e. claim 12). Claims 5-8, further disclose the addition of a base. Matthews discloses that ammonia gas is diffused into the tank, and goes on to disclose that “[o]ptionally, ozone in conjunction with UV radiation may be used to generate the oxygen free radical”. Because, ammonia, when bubbled into water, forms ammonium hydroxide, and ammonium hydroxide is a base, the limitation of claims 5-8 regarding the presence of a base are disclosed.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 10, 12, 14, 16, 26, 28, 30, and 32 rejected under 35 U.S.C. 103(a) as being unpatentable over Matthews, as discussed above, in view of United States Patent No. 6,403,498 to Matsuo et al. Each and every limitation of claims 10-16 and 26-32 are identically disclosed in Matthews, as set forth above, except that Matthews et al. apparently fails to explicitly disclose the presence of a UV light source having a wavelength between 242.4 and 300 nm. It is noted that such a disclosure is necessarily inherent. Absent such an element the system seemingly

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would not function. However, in the interests of compact prosecution, a secondary reference is provided to make explicit, that which is implicit in Matthews. Matsuo et al. disclose a processing chamber and a lamp chamber that are insulated from each other by a shutter. When the shutter is opened, the processing chamber is connected to the lamp chamber, such that an ultraviolet ray from the lamp is irradiated onto the substrate. When the lamp is turned on, a main ultraviolet ray having a wavelength of 254 nm and a subordinate ultraviolet ray having a wavelength of 185 nm are emitted. The artisan would have been motivated to use UV emitting source of Matsuo et al. in the Matthews invention, because absent such an element the UV facilitated reactions would not occur. Further, it is noted that the basic chemistry of UV induced radical oxygen production, is well known in the prior art of record. It is noted that Applicant, seemingly had to rely on such a source in order to provide the equations on page 8. See also the thesis of Matthew J. Harris, disclosing the indicated wavelengths, and disclosing that the UV induced chemistry was known since the 1930's, and providing the motivation for selecting such wavelengths if practicing the invention of Matthews.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- a. PGPub. No. 20020088478 to De Gendt et al. discloses a substrate (wafer) treatment method comprising treating a work object on a surface of a substrate at a temperature by supplying to said work object a wet ozone-containing gas wetted with a treatment solution (water--inherent in the moist O₃ ambient), wherein the wet ozone-

containing gas contains a concentration of vapor of the treatment solution larger than a saturation vapor level (thin condensation layer forms on the wafer) of the treatment solution at the temperature of the substrate (thin condensation layer).

b. United States Patent No. 5,975,098 to Yoshitani et al. discloses a chemical cleaning process that includes using pure water, neutral or alkaline cleaning liquid, and ozone water which is obtained by dissolving ozone in cleaning liquid. The solution is disclosed to be effective for removal of relatively fine foreign matter and foreign matter that is chemically bonded to a substrate, but is disclosed to be less effective for larger foreign deposits. The disclosure further states that physical cleaning is often performed in addition to chemical cleaning.

c. United States Patent No. 5,288,333 to Tanka et al. discloses a cleaning treatment using ultraviolet radiation and ozone supply is effective for elimination of organic contamination. Having this fact in view, Tanka et al.'s third embodiment, as shown in FIG. 9, discloses an ultraviolet/ozone (UV/O₃) cleaning chamber.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gentle E. Winter whose telephone number is (703) 305-3403. The examiner can normally be reached on Monday-Friday, 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy P. Gulakowski can be reached on (703) 308-4333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular

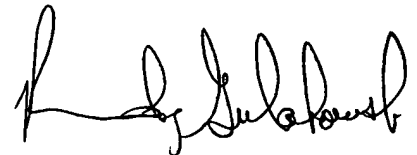
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communications and (703) 872-9311 for After Final communications. The direct fax number for this examiner is (703) 746-7746.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Gentle E. Winter
Examiner
Art Unit 1746

September 9, 2002

A handwritten signature in black ink, appearing to read "Randy Gulakowski", written in a cursive style.

RANDY GULAKOWSKI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700